



ACT-350



Test Bed Capability in support of UAT MOPS Development



Introduction

- ◆ FAA WJH TC Facility Resources
- ◆ Test Bed Components, Functionality, and Analysis Capabilities
- ◆ UAT Message Generation
- ◆ UAT Receiver Analysis
- ◆ UAT Measurement Facility (UMF) Description and Capabilities
- ◆ Detailed MOPS Issues Analysis



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FAA WJH Tech Center Facility Resources

- ◆ Flight Test Aircraft
- ◆ ATC Enroute / Terminal Systems
- ◆ Flight Measurement Systems
- ◆ Communication, Navigation & Surveillance Systems



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Communications, Navigation and Surveillance

**Short-Range/Long-Range
Radar Facilities**





UAT Test Bed Components

- ◆ 2 Complete Capstone Kits
 - UAT – Transceiver
 - ADS-B Avionics (MFD/GPS/Comm/Alt Encdr)
- ◆ UAT Measurement Facility (UMF) – Qty 2
- ◆ Laboratory Test Equipment, including:
 - Vector Signal Generator – to 2.2 GHz
 - Vector Signal Analyzer – to 2.6 GHz



UAT Test Bed Components (Continued)

- ◆ PC System Controlled by/via GPIB, RS-232, and RS-422 Interfaces
- ◆ The FAA's fleet of specially instrumented aircraft, "flying laboratories" are available for flight testing
- ◆ ADS-B Ground Systems
- ◆ ADS-B Engineering Laboratory



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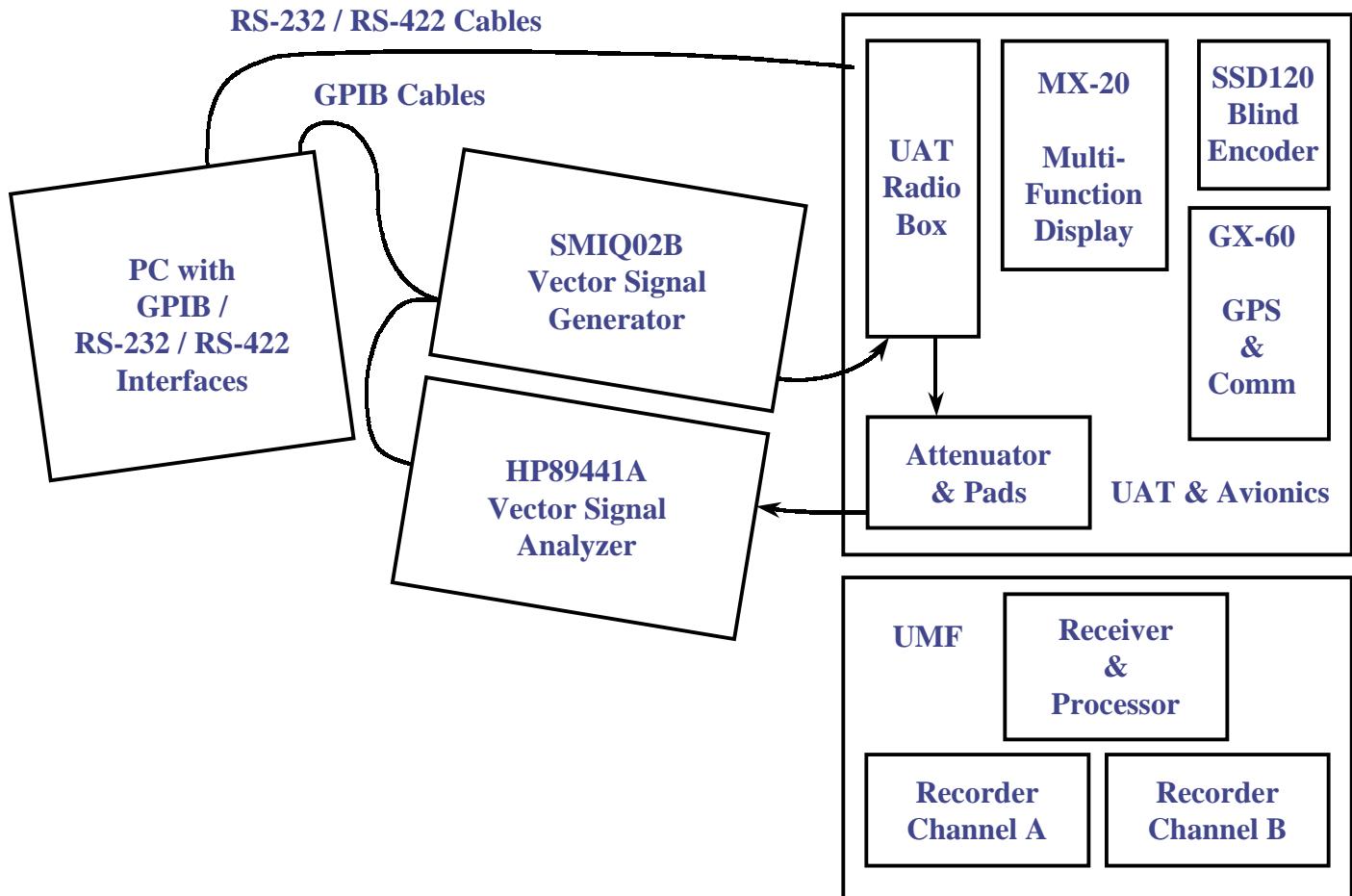
FAA's Flying Laboratories



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UAT Basic Test Bed Configuration





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12/13/2000



UAT Test Bed Functionality

- ◆ Send/Generate/Receive UAT Messages
- ◆ Accurate Signal Measurements with Graphic and Text Output (HP89441A)
 - Gated Time & Freq Band Power
 - Frequency Spectrum
 - Digital FM Modulation Parameters
- ◆ PC Instrument Control, Monitoring, and Message Generation



UAT Test Bed Analysis Capabilities

- ◆ Complete UAT and Avionics Operation
- ◆ Detailed Analysis of UAT Signal and Message Parameters
- ◆ Message Error Rate (MER) Measurement
- ◆ Bench Test Measurements
- ◆ Recorded Flight Test Data Analysis
- ◆ Frequency Selection & Spectrum Issues
- ◆ Flight Test Performance Validation

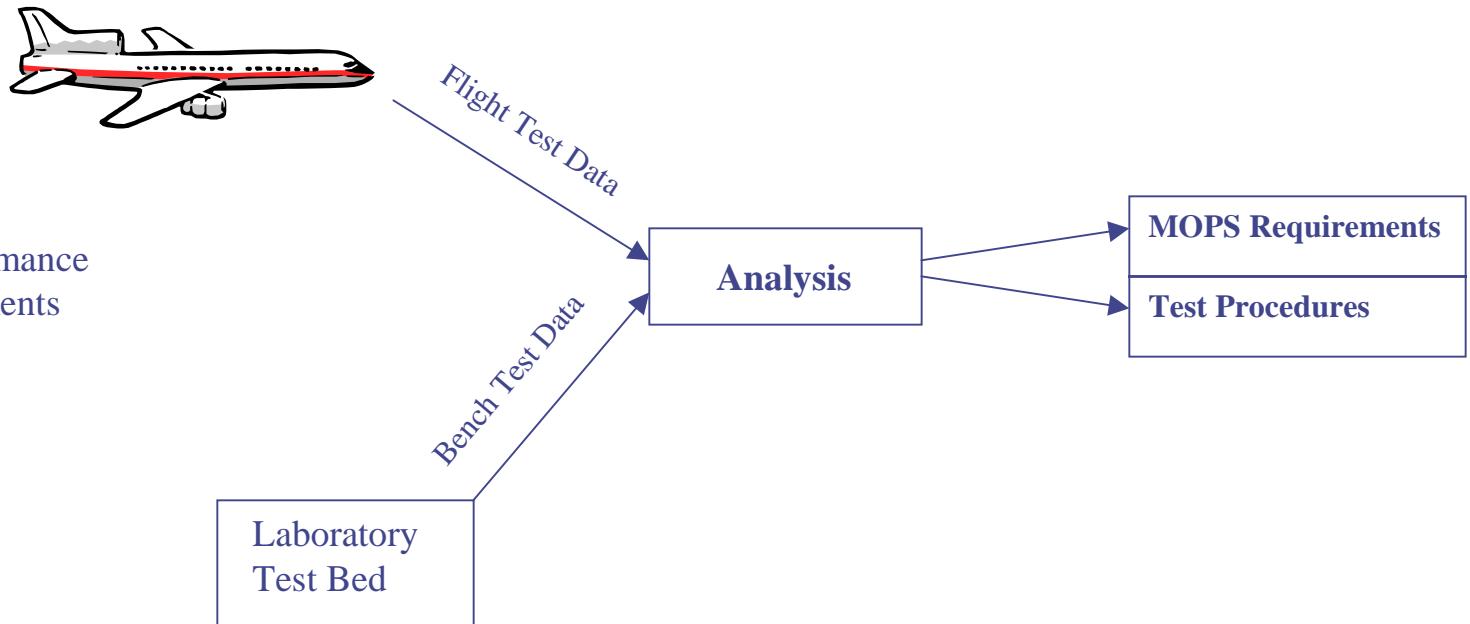


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ISSUES:

- System Performance
- Test Requirements
- Spectrum





UAT Message Generation

◆ UAT Capstone Transceiver

- Transmit and/or Receive operation
- Short/Long Test Mode – 45 Messages/Second
- Ground Test Mode – 9 Messages/Second

◆ Rohde & Schwarz Vector Signal Generator

- Full latitude for setting parameters
- Parameter loading Manually or by PC



UAT Receiver Analysis

- ◆ Message Error Rate
- ◆ Co-site Interference
- ◆ Error Correction Confirmation
- ◆ Receiver Characterization
- ◆ MTL Measurement



UAT System Description

- ◆ Detailed Recording at UAT Carrier Frequency
- ◆ Dual Channel Recording Enabling Full Diversity Flight Recording
- ◆ Post-UAT Message Reception & Signal Analysis



UMF Capabilities

◆ RF Front End

- Adjustable Center Frequency
- 20 MHz IF

◆ Digital Receiver/Processor

- 64 MHz A/D, 12 Bits
- Dual Channel (I&Q) 2 MSPS x 16 Bit Output



UMF Capabilities (Continued)

◆ Flight Recording

- 1 hour, 27.5 minute recording (42 GB tape)
- ≈ 12 dB S/N @ -95 dBm (UAT MER $\approx 50\%$)
- Synchronized Time-Stamped Data Blocks
 - ◆ (≈ 16 ms time resolution)

◆ Off-Line Data Analysis

- Message is demodulated, bit values detected and message fields are extracted
- Frequency and Power level is calculated



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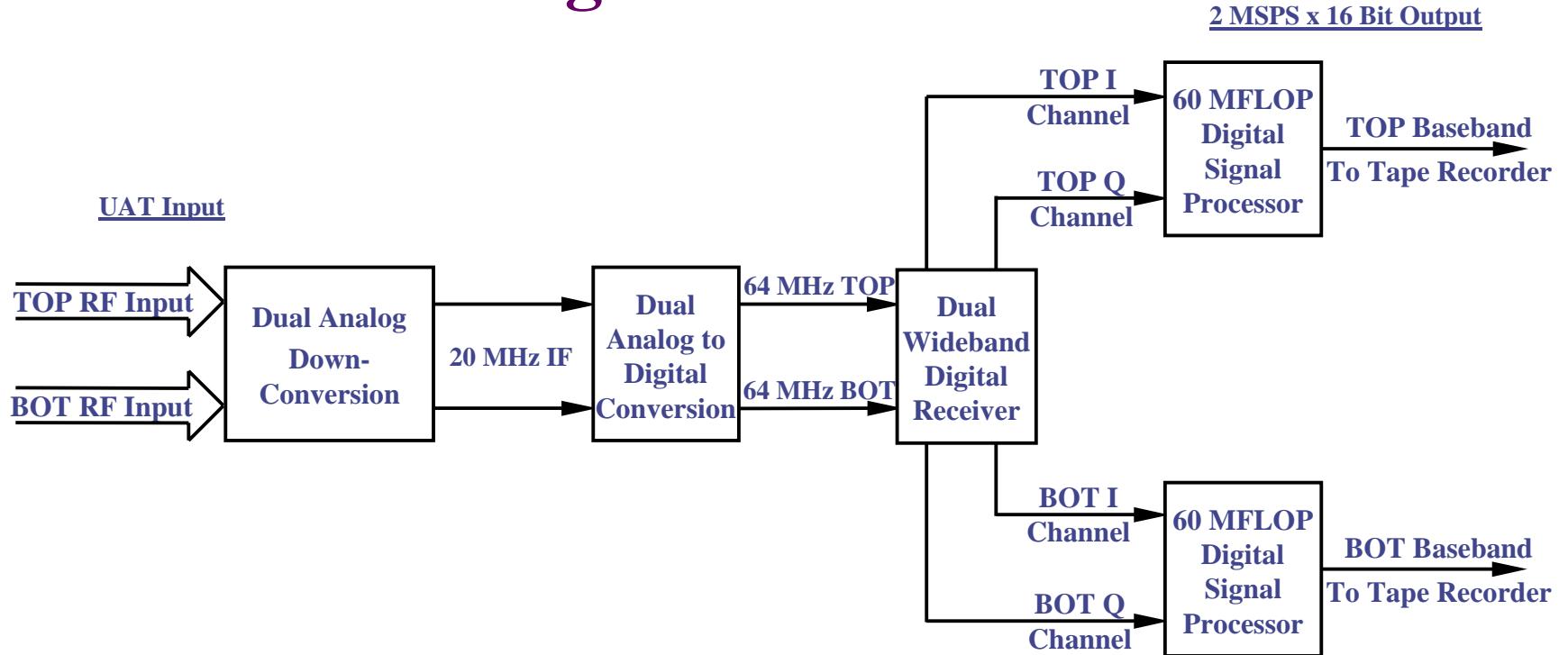




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UMF Block Diagram





Summary

◆ Flexible Test Bed Capability

- Capable of supporting MOPS Requirements and Test Procedure Development
- UAT Transmitter and Receiver Characteristics can be synthesized and analyzed
- Supports Flight Test Data collection and Bench Test Measurements of prototype UAT Transceivers